

REMARKS

I. Introduction

In response to the Office Action dated May 3, 2005, Applicants have canceled claims 1-4, without prejudice or disclaimer. Also, Applicants have amended claims 5-6, 9 and 11 so as to further clarify the claimed subject matter, and to address the pending rejection under 35 U.S.C. §112. New claims 15-16 are added. Support for the amendments to claims 6 and 11 can be found, for example, at page 19, line 12 to page 20, line 1, page 22, lines 5-18 and page 23, lines 8-22 of the specification; support for the amendments to claims 5 and 9 can be found, for example, at page 11, line 23 to page 12, line 9, page 18, line 19 to page 20, line 1, page 21, line 10 to page 24, line 18 and page 25, lines 6-17 of the specification; and support for new claims 15 and 16 can be found, for example, at page 19, line 8 and page 22, line 1 of the specification. No new matter has been added.

For the reasons set forth below, Applicants respectfully submit that all pending claims are patentable over the cited prior art references.

II. The Rejection Of Claims 2, 6 and 11 Under 35 U.S.C. § 112, Second Paragraph

Claims 2, 6 and 11 are rejected under 35 U.S.C. § 112, second paragraph, as being indefinite. As claim 2 has been canceled, the rejection thereto is moot. With respect claims 6 and 11, the Examiner asserts that “the pattern size should be larger because the sidewall of the resist pattern is not protected with the deposits.” However, by setting the etching condition as described at page 19, line 12 to page 20, line 4 of the specification, substantially no deposits are formed on the sidewalls of the resist pattern, as shown in Fig. 9(c) of Applicants’ drawings.

Consequently, the resist pattern contracts and the remaining pattern size obtained after the etching of the film is smaller or narrower than a predetermined size (see, e.g., Figs. 9(a)-9(d)).

Nonetheless, in an effort to advance prosecution, claim 6 has been amended to recite “the etching is performed so that a remaining pattern size obtained after the etching of the film to be etched is narrower than a predetermined size.” Accordingly, it is respectfully requested that the pending rejection under 35 U.S.C. § 112, second paragraph to claim 6 be withdrawn in view of the foregoing amendment.

Similarly, with respect to claim 11, as set forth at page 22, lines 5-18 and page 23, lines 8-22 of the specification, the silicon nitride film 14 is etched in the first stage of the etching process so that the pattern shift is increased in positive value (see, Fig. 10(c)) so that the pattern size obtained after etching of the film to be etched is wider than a predetermined size. Then, the silicon nitride film 14 is etched in the second stage of the etching process so that the pattern shift becomes negative and the remaining pattern size obtained after the etching of the film to be etched is narrower than a predetermined size. As a result, the present invention can advantageously prevent any resist tilting and therefore desirably obtain a circuit pattern in which the pattern shift is substantially zero.

Nonetheless, in an effort to advance prosecution, claim 11 has been amended to recite “... in the step (a) of the third step, the etching is performed so that a remaining pattern size obtained after the etching of the film to be etched is wider ~~larger~~ than a predetermined size, and ... in the step (b) of the third step, the remaining pattern size obtained after the etching of the film to be etched is narrower ~~smaller~~ than a predetermined size.” Accordingly, it is respectfully requested that the pending rejection under 35 U.S.C. § 112, second paragraph to claim 11 be withdrawn in view of the foregoing amendment.

III. The Rejection Of Claim 1 Under 35 U.S.C. § 102

Claim 1 is rejected under 35 U.S.C. § 102(e) as being anticipated by USP No. 6,569,778 to Lee. As claim 1 has been canceled, the rejection thereto is moot.

IV. The Rejection Of Claims 2-14 Under 35 U.S.C. § 103

Claims 2-14 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Lee in view of USP No. 5,549,784 to Carmody. As claims 2-4 have been canceled, the rejections thereto are moot. For the remaining claims, Applicants respectfully request reconsideration of this rejection for at least the following reasons.

Claim 5, as amended, recites in-part that in the third step, the step of etching the film to be etched is performed simultaneously with a step of etching the deposits deposited on both side faces of the resist pattern.

In contrast, Lee discloses a step of etching the interlayer dielectric layer 24' disposed between the gate electrodes 21 using the polymer 28 as a mask, as shown in Fig. 2D. During this step, the polymer 28 is not etched away. Then, as illustrated in Fig. 2E, the nitride layer 23 remaining between the gate electrodes is removed by using the polymer 28 as a mask, and the contact hole forming process concludes upon the removal of the polymer 28 (see, col. 6, lines 16-20). Thus, as is apparent, the step of etching the interlayer dielectric layer 24' (Fig. 2C) and the step of removing the polymer 28 (Fig. 2E) are evidently carried out at different stages of the contact hole forming process. In other words, the step of etching the polymer 28 is not performed simultaneously with that of the interlayer dielectric layer 24. This is further evidenced by the fact that the contact hole forming process of Lee is expressly defined as

comprising three “separate and distinct” etching processes, wherein each etching process utilizes different etching conditions (e.g., substrate temperature, pressure, power and amount of etching gas) so as to minimize the deformation of the photoresist pattern and the loss of the gate electrode (see, col. 6, lines 21-29). Accordingly, it is respectfully submitted that Lee does not disclose or suggest *the step of etching the film to be etched being performed simultaneously with a step of etching the deposits deposited on both side faces of the resist pattern* as recited by claim 5. It should be noted that Carmody does not cure this defect of Lee, because Carmody does not disclose either step of depositing or etching any deposit deposited on both side faces of the photoresist, let alone suggest performing both steps simultaneously.

In contrast to the cited prior art, in accordance with one exemplary embodiment of the present invention, the film to be etched is etched by using the resist pattern as a mask during the third step so that no deposits are deposited on both side faces of the resist pattern. Specifically, the deposits are prevented from being deposited onto the side faces of the resist pattern, because the step of etching the deposits and the step of etching the film are performed simultaneously. As a result, the present invention can advantageously obtain a film having an anisotropic shape while preventing any resist tilting thereof.

With respect to claim 9, as this claim also includes the claimed feature regarding *the step of etching the film to be etched being performed simultaneously with a step of etching the deposits deposited on both side faces of the resist pattern*, it is respectfully submitted that claim 9 is patentable over the cited prior art for at least the same reasons discussed above with respect to claim 5.

Based upon the foregoing it should be apparent that even if the applied references are combined, the combination does not result in the claimed invention. Thus, as each and every

limitation must be either disclosed or suggested by the cited prior art in order to establish a *prima facie* case of obviousness (see, **M.P.E.P. § 2143.03**), and Lee and Carmody, taken alone or in combination, fail to do so, it is respectfully submitted that claims 5 and 9 are patentable over the cited prior art.

V. The Rejection Of Claims 5 and 9 Under 35 U.S.C. § 103

Claims 5 and 9 are rejected under 35 U.S.C. § 103(a) as being unpatentable over USP No. 6,337,277 to Chou in view of USP No. 6,087,063 to Hada. Applicants respectfully request reconsideration of this rejection for at least the following reasons.

With respect to claim 5, in the statement of rejection, it is asserted that Chou discloses “etching the dielectric material using the photoresist mask” and “depositing unwanted polymer deposits and then etching the unwanted polymer deposits.” However, it is important to note that the condensed layer 110 and the organic polymer layer 106 of Chou are etched while the passivating film 112 is formed on the walls of the resist 108 and the condensed layer 110, as shown in Fig. 3C (see, col. 11, lines 64-67). Then, by evaporating the condensed vapor, the passivating film 112 is removed from the walls of the resist 108 and the condensed layer 110 (see, Fig. 3E and col. 12, lines 13-46). As such, it is clear that the step of etching the organic polymer 106 while depositing the passivating film 112 (Figs. 3C and 3D), and the step of removing the passivating film 112 (Fig. 3E) are performed separately. This is further supported by the fact that the foregoing steps are performed under distinct conditions (e.g., the organic polymer layer 106 is etched while the passivating film is deposited by controlling the gas chemistry and reactor conditions, whereas the condensed vapor is evaporated by returning the process to its initial and stable conditions in addition to increasing the substrate temperature).

Accordingly, Chou does not disclose or suggest *the step of etching the film to be etched being performed simultaneously with a step of etching the deposits deposited on both side faces of the resist pattern*, as recited by claim 5. Hada does not cure this defect of Chou, because Hada does not disclose the step of depositing or etching any deposit deposited on both side faces of the photoresist, let alone suggest performing both steps simultaneously.

In contrast, in accordance with one exemplary embodiment of the present invention, the antireflection film and the silicon nitride film are etched using the resist pattern during an etching step including a sub-step of etching the film so that no deposits are deposited. Specifically, during the sub-step, the etching gas for allowing the etching to proceed, the gas for producing the deposits and the gas for etching the deposits are provided at the same time (see, Fig. 9C and page 19, line 19 to page 20, line 1). By adjusting the pressure, the power and the temperature of the lower electrode, the steps of etching the film, depositing the deposits and etching the deposits are performed simultaneously (see, e.g., page 11, line 23 to page 12, line 9 and page 18, line 19 to page 20, line 1).

With respect to claim 9, as this claim also include the claimed feature regarding *the step of etching the film to be etched being performed simultaneously with a step of etching the deposits deposited on both side faces of the resist pattern*, it is respectfully submitted that claim 9 is patentable over the cited prior art for at least the same reasons discussed above with respect to claim 5.

Based upon the foregoing it should be apparent that even if the applied references are combined, the claimed invention would not result. *Uniroyal, Inc. v. Rudkin-Wiley Corp.*, 837 F.2d 1044, 5 USPQ2d 1434 (Fed. Cir. 1988). Thus, as each and every limitation must be either disclosed or suggested by the cited prior art in order to establish a *prima facie* case of

obviousness (see, **M.P.E.P. § 2143.03**), and Chou and Hada, taken alone or in combination, fail to do so, it is respectfully submitted that claims 5 and 9 are patentable over the cited prior art.

VI. All Dependent Claims Are Allowable Because The Independent Claims From Which They Depend Are Allowable

Under Federal Circuit guidelines, a dependent claim is nonobvious if the independent claim upon which it depends is allowable because all the limitations of the independent claim are contained in the dependent claims, *Hartness International Inc. v. Simplimatic Engineering Co.*, 819 F.2d at 1100, 1108 (Fed. Cir. 1987). Accordingly, as independent claims 5 and 9 are patentable for the reasons set forth above, it is respectfully submitted that all claims dependent thereon are also in condition for allowance.

VII. Conclusion

Accordingly, it is urged that the application is in condition for allowance, an indication of which is respectfully solicited.

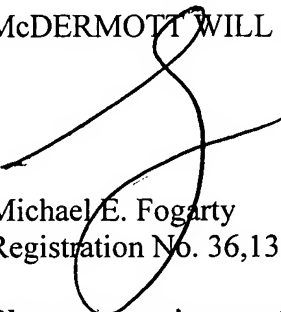
If there are any outstanding issues that might be resolved by an interview or an Examiner's amendment, the Examiner is requested to call Applicants' attorney at the telephone number shown below.

Application No.: 10/653,200

To the extent necessary, a petition for an extension of time under 37 C.F.R. § 1.136 is hereby made. Please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 500417 and please credit any excess fees to such deposit account.

Respectfully submitted,

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